AMENDMENT TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1-34. (Cancelled)

35. (Currently Amended) A fuel cell including a fuel cell stack formed by stacking a ~~plurality of unit cells~~ a first unit cell and a second unit cell next to the first unit cell,

~~at least one of the plurality of~~ each of the first and the second unit cells comprising:

a cell having an anode, a cathode, and an electrolyte between the anode and the cathode;

a first plate having a first surface, a second surface at opposite side to the first surface, a plurality of fuel gas channels being juxtaposed on the first surface and facing the anode of the cell, and both a fuel gas inlet header and a fuel gas outlet header disposed on the first surface and connected with the plurality of fuel gas channels for distributing a fuel gas; and

a second plate having a third surface, a fourth surface at opposite side to the third surface, a plurality of ~~oxidizer~~ oxidant gas channels being juxtaposed on the third surface and facing to the cathode of the cell, and both an ~~oxidizer~~ oxidant gas inlet header and an ~~oxidizer~~ oxidant gas outlet header disposed on the third surface and connected with the plurality of ~~oxidizer~~ oxidant gas channels for distributing an ~~oxidizer~~ oxidant gas; and

the fuel cell stack comprising a heat medium pass between the second surface of the first plate of the first unit cell and the fourth surface of the second plate of the second unit cell, the medium pass comprising a plurality of heat medium channels for distributing a heat medium, a heat medium inlet header and a heat medium outlet header, and both [[a]] the heat medium inlet

header and [[a]] the heat medium outlet header being connected with the plurality of heat medium channels~~, the plurality of heat medium channels juxtaposed on the second surface or in the second plate~~, and

wherein condensation of water vapor contained in the fuel gas or in the ~~oxidizer~~ oxidant gas is prevented, in normal operation, ~~by disposing at least one of the fuel gas inlet header and the oxidizer gas inlet header on the side opposite to the heat medium inlet header or the heat medium outlet header or by disposing the oxidizer gas inlet header on the second surface of the first plate when the plurality of heat medium channels, the heat medium inlet header and a heat medium outlet header are disposed on the fourth surface of the second plate, and heating at least one of~~ by heating the fuel gas inlet header ~~and~~ or the ~~oxidizer~~ oxidant gas inlet header with the heat medium by disposing at least one of the fuel gas inlet header and the oxidant gas inlet header (1) to face the heat medium inlet header or the heat medium outlet header or (2) to be close to, and back to back with, the heat medium inlet header or the heat medium outlet header.

36. (Currently Amended) A fuel cell according to claim 35, wherein the at least one of the fuel gas inlet header and the ~~oxidizer~~ oxidant gas inlet header is maintained, in normal operation, at a temperature of the dew point of at least one of the fuel gas and the ~~oxidizer~~ oxidant gas or higher by heat transfer from the heat medium.

37. (Withdrawn) A fuel cell, including a fuel cell stack,

the fuel cell stack comprising:

a first plate including a plurality of juxtaposed fuel gas channels for distributing a fuel gas and a fuel gas inlet header connected with the fuel gas channel on one surface thereof;

a second plate including a plurality of juxtaposed oxidizer gas channels for distributing an oxidizer gas and an oxidizer gas inlet header connected with the oxidizer gas channel on one surface thereof;

at least one of the other surface of the first plate and the other surface of the second plate including a heat medium channel for distributing a heat medium, and a heat medium inlet header and a heat medium outlet header connected with the heat medium channel; and

a third plate including a plurality of juxtaposed fuel gas channels for distributing a fuel gas and a fuel gas inlet header connected with the fuel gas channel on one surface thereof and a plurality of juxtaposed oxidizer gas channels for distributing an oxidizer gas and an oxidizer gas inlet header connected with the oxidizer gas channel on the other surface,

wherein the fuel cell stack being formed by laminating and integrating a plurality of unit cells into a single unit,

each cell unit being formed by inserting a cell composed of a pair of electrodes and an electrolyte between the surface having the fuel gas channel of the first plate or the third plate and the surface having the oxidizer gas channel of the second plate or the third plate so that the fuel gas channel of the first plate or the third plate and the oxidizer gas channel of the second plate or the third plate face the anode and the cathode of the cell in close contact therewith, respectively, and

condensation of water vapor contained in the fuel gas or in the oxidizer gas is prevented, in normal operation, by heating the oxidizer gas inlet header with the fuel gas supplied to the oxidizer gas inlet header or by heating the fuel gas inlet header with the oxidizer gas supplied to the oxidizer gas inlet header.

38. (Withdrawn) A fuel cell according to Claim 37, wherein the temperature of the fuel gas supplied to the fuel gas inlet header is set to the dew point of the oxidizer gas supplied to the oxidizer gas inlet header or higher, and the temperature of the oxidizer gas supplied to the oxidizer gas inlet header is set to the dew point of the fuel gas supplied to the fuel gas inlet header or higher.

39. (Withdrawn) A fuel cell, including a fuel cell stack,

the fuel cell stack comprising:

a first plate including a plurality of juxtaposed fuel gas channels for distributing a fuel gas and a fuel gas inlet header connected with the fuel gas channel on one surface thereof;

a second plate including a plurality of juxtaposed oxidizer gas channels for distributing an oxidizer gas and an oxidizer gas inlet header connected with the oxidizer gas channel on one surface thereof;

at least one of the other surface of the first plate and the other surface of the second plate including a heat medium channel, and a heat medium inlet header and a heat medium outlet header connected with the heat medium channel respectively; and

a third plate including a plurality of juxtaposed fuel gas channels for distributing a fuel gas and a fuel gas inlet header connected with the fuel gas channel on one surface thereof and a plurality of juxtaposed oxidizer gas channels for distributing an oxidizer gas and an oxidizer gas inlet header connected with the oxidizer gas channel on the other surface,

wherein the fuel cell stack being formed by laminating and integrating a plurality of unit cells into a single unit,

each unit cell being formed by inserting a cell composed of a pair of electrodes and an electrolyte between the surface having the fuel gas channel of the first plate or the third plate and the surface having the oxidizer gas channel of the second plate or the third plate so that the fuel gas channel of the first plate or the third plate and the oxidizer gas channel of the second plate or the third plate face the anode and the cathode of the cell in close contact therewith, respectively, and

condensation of water vapor contained in the fuel gas and in the oxidizer gas is prevented, in normal operation, by disposing the fuel gas inlet header and the oxidizer gas inlet header so as to face the heat medium inlet header or heat medium outlet header, and heating the fuel gas inlet header and the oxidizer gas inlet header with the heat medium.

40. (Withdrawn) A fuel cell according to Claim 39, wherein the fuel gas distributed in the fuel gas channel in the first plate and the third plate and the oxidizer gas distributed in the oxidizer gas channel in the second plate and the third plate flow in parallel to each other from top to bottom in the direction of gravity, and

the heat medium distributed in the heat medium channel formed by the first plate and the second plate flows in parallel or anti-parallel to the fuel gas and the oxidizer gas.

41. (Withdrawn) A fuel cell according to Claim 39, wherein the fuel gas channel in the first plate and the third plate and the oxidizer channel in the second plate and the third plate are formed substantially straight, respectively.

42. (Withdrawn) A fuel cell according to Claim 40, wherein the condensation of water vapor contained in the fuel gas or in the oxidizer gas is prevented by heating the fuel gas inlet header or the oxidizer gas inlet header,

at least one of the dew point of the fuel gas supplied to the fuel gas inlet header and the dew point of the oxidizer gas supplied to the oxidizer gas inlet header is set to the heat medium temperature at the heat medium inlet header or lower when the heat medium distributed in the heat medium channel formed by the first plate and the second plate flows in parallel to the fuel gas distributed in the fuel gas channel in the first plate and the third plate and the oxidizer gas distributed in the oxidizer gas channel in the second plate and the third plate in normal operation; and

at least one of the dew point of the fuel gas supplied to the fuel gas inlet header and the dew point of the oxidizer gas supplied to the oxidizer gas inlet header is set to the heat medium temperature at the heat medium outlet header or lower when the heat medium distributed in the heat medium channel formed by the first plate and the second plate flows in anti-parallel to the fuel gas distributed in the fuel gas channel in the first plate and the third plate and the oxidizer gas distributed in the oxidizer gas channel in the second plate and the third plate.

43. (Withdrawn) A fuel cell according to Claim 6, wherein gas distribution in the fuel gas channel or in the oxidizer gas channel is uniformed by:

setting at least one of the dew point of the fuel gas at the fuel gas outlet header connected with the fuel gas channel in the first plate and the third plate and the dew point of the oxidizer gas at the oxidizer gas outlet header connected with the oxidizer gas channel in the second plate and the third plate to the heat medium temperature at the heat medium outlet header connected

with the heat medium channel formed by the first plate and the second plate or higher, when the heat medium distributed in the heat medium channel formed by the first plate and the second plate flows in parallel to the fuel gas distributed in the fuel gas channel in the first plate and the third plate and the oxidizer gas distributed in the oxidizer gas channel in the second plate and the third plate which flow in parallel to each other;

setting at least one of the dew point of the fuel gas at the fuel gas outlet header connected with the fuel gas channel in the first plate and the third plate and the dew point of the oxidizer gas at the oxidizer gas outlet header connected with the oxidizer gas channel in the second plate and the third plate to the heat medium temperature at the heat medium inlet header connected with the heat medium channel formed by the first plate and the second plate or higher, when the heat medium distributed in the heat medium channel formed by the first plate and the second plate flows in anti-parallel to the fuel gas distributed in the fuel gas channel in the first plate and the third plate and the oxidizer gas distributed in the oxidizer gas channel in the second plate and the third plate; and

forcedly cooling the fuel gas or the oxidizer gas with the heat medium at the outlet area of the fuel gas channel or the oxidizer gas channel to forcedly condensate the water vapor contained in the fuel gas or in the oxidizer gas.

44. (Withdrawn) A fuel cell, including a fuel cell stack,

the fuel cell stack comprising:

a first plate including a plurality of fuel gas channels for distributing a fuel gas, juxtaposed on one surface thereof, and a second plate including a plurality of oxidizer gas channels for distributing an oxidizer gas, juxtaposed on one surface thereof;

at least one of the other surface of the first plate and the other surface of the second plate including a heat medium channel for distributing a heat medium; and

the surface having the fuel gas channel of the first plate and the surface having the oxidizer gas channel of the second plate including fuel gas and oxygen gas inlet headers connected with the respective gas channels thereof,

the fuel cell stack being formed by laminating and integrating a plurality of unit cells into a single unit, and

each unit cell being formed by inserting a cell composed of a pair of electrodes and an electrolyte between the surface having the fuel gas channel of the first plate and the surface having the oxidizer gas channel of the second plate so that the fuel gas channel of the first plate and the oxidizer gas channel of the second plate face the anode and cathode of the cell in close contact therewith, respectively, wherein

the heat medium channel includes a heat medium supply opening provided at a portion corresponding to a lower area below the gas inlet header of the fuel gas channel or below the gas inlet header of the oxidizer gas channel;

the lower area is cooled by supplying the heat medium through the heat medium supply opening to thereby forcedly condensate the water vapor contained in the fuel gas or in the oxidizer gas; and

the heat medium after distributed in the heat medium channel is supplied to an upper area above the heat medium supply opening through a connecting passage to thereby heat the gas inlet header of the fuel gas channel or the gas inlet header of the oxidizer gas channel which faces the upper area, and then discharged through a heat medium discharge outlet.

45. (Withdrawn) A fuel cell, including a fuel cell stack,

the fuel cell stack comprising:

a first plate including a plurality of fuel gas channels for distributing a fuel gas, juxtaposed on one surface thereof, and a second plate including a plurality of oxidizer gas channels for distributing an oxidizer gas, juxtaposed on one surface thereof;

at least one of the other surface of the first plate and the other surface of the second plate including a heat medium channel for distributing a heat medium; and

the surface having the fuel gas channel of the first plate and the surface having the oxidizer gas channel of the second plate including fuel gas and oxidizer gas inlet headers connected with the respective gas channels thereof,

the fuel cell stack being formed by laminating and integrating a plurality of unit cells into a single unit, and

each unit cell being formed by inserting a cell composed of a pair of electrodes and an electrolyte between the surface having the fuel gas channel of the first plate and the surface having the oxidizer gas channel of the second plate so that the fuel gas channel of the first plate and the oxidizer gas channel of the second plate face the anode and cathode of the cell in close contact therewith, respectively, wherein

a flow resistance generation section is disposed at a lower area below the gas inlet header part of at least one of the gas channels so as to connect the gas inlet header with the corresponding gas channel through the flow resistance generation section;

the heat medium channel includes a heat medium supply opening provided at a portion corresponding to a lower area below the flow resistance generation section;

the lower area below the flow resistance generation section is cooled by supplying the heat medium through the heat medium supply opening to thereby forcedly condensate water vapor contained in the fuel gas or in the oxidizer gas; and

the heat medium after distributed in the heat medium channel is supplied to an upper area above the heat medium supply opening through a connecting passage to thereby heat the flow resistance generation section facing the upper area, and then discharged through a heat medium discharge outlet.

46. (Withdrawn) A fuel cell according to claim 11, wherein the temperature of the heat medium supplied to the heat medium channel through the heat medium supply opening is set to the dew point of the fuel gas or the oxidizer gas distributed in the lower area below the flow resistance generation section disposed on at least the one gas channel or lower, and

the temperature of the heat medium supplied to the upper area above the heat medium supply opening through the connecting passage after distributed in the heat medium channel is set to the dew point of the fuel gas or oxidizer gas supplied to the gas inlet header or higher.

47. (Withdrawn) A fuel cell according to Claim 11, wherein the flow resistance generation section is designed, as for the size, to fit in a concave portion provided in an inlet area of the gas channel, a plurality of projection pieces provided at one end side thereof so that each of them has a nozzle hole with a sectional area smaller than that of the gas channel respectively, and the gas inlet header is connected with the gas channel by inserting and attaching each projection piece into each flow passage of the gas channel to hereby eject the fuel gas or the oxidizer gas through the nozzle holes.

48. (Withdrawn) A fuel cell system, comprising a circulation pathway for the heat medium,

the circulation pathway being formed by:

connecting one of a fuel humidifier and an oxidizer humidifier to a heat medium discharge outlet of a fuel cell, connecting the other humidifier to the one humidifier, connecting a heat exchanger for heat-exchange between the heat medium and a second heat medium to the other humidifier, and connecting a heat medium supply opening of the fuel cell to the heat exchanger; or

connecting a heat exchanger for heat exchange between the heat medium and a second heat medium to a heat medium discharge outlet of a fuel cell, connecting one of a fuel humidifier and an oxidizer humidifier to the heat exchanger, connecting the other humidifier to the one humidifier, and connecting a heat medium supply opening of the fuel cell to the other humidifier.

49. (Withdrawn) A fuel cell system according to Claim 14, which comprises a distribution pathway for fuel gas or oxidizer gas, the distribution pathway being formed by:

connecting a first fluid supply opening of a total heat exchanger to at least one of a fuel gas discharge opening and an oxidizer gas discharge opening of the fuel cell to supply the fuel gas or the oxidizer gas to a second fluid supply opening of the total heat exchanger;

connecting the fuel humidifier or the oxidizer humidifier to a second fluid discharge outlet of the total heat exchanger; and

connecting a fuel gas supply opening or an oxidizer gas supply opening of the fuel cell to the fuel humidifier or the oxidizer humidifier.

50. (Withdrawn) A fuel cell system according to Claim 14, wherein, when the fuel gas and the oxidizer gas flow in parallel to each other, and the heat medium flows in parallel to these reaction gases, the heat medium discharged out of the fuel cell is distributed in the order of the heat exchanger, the oxidizer humidifier and the fuel humidifier and returned to the fuel cell.

51. (Withdrawn) A fuel cell system according to Claim 14, wherein, when the fuel gas and the oxidizer gas flow in parallel to each other, and the heat medium flows in anti-parallel to these reaction gases, the heat medium discharged out of the fuel cell is distributed in the order of the oxidizer humidifier, the fuel humidifier and the heat exchanger and returned to the fuel cell.